

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Education
Advanced Subsidiary/Advanced



CYD-BWYLLGOR ADDYSG CYMRU
Tystysgrif Addysg Gyffredinol
Uwch Gyfrannol/Uwch

312/01

BIOLOGY

MODULE BI2

A.M. TUESDAY, 10 January 2006

(1 hour 30 minutes)

For Examiner's Use Only

Total Marks	
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INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

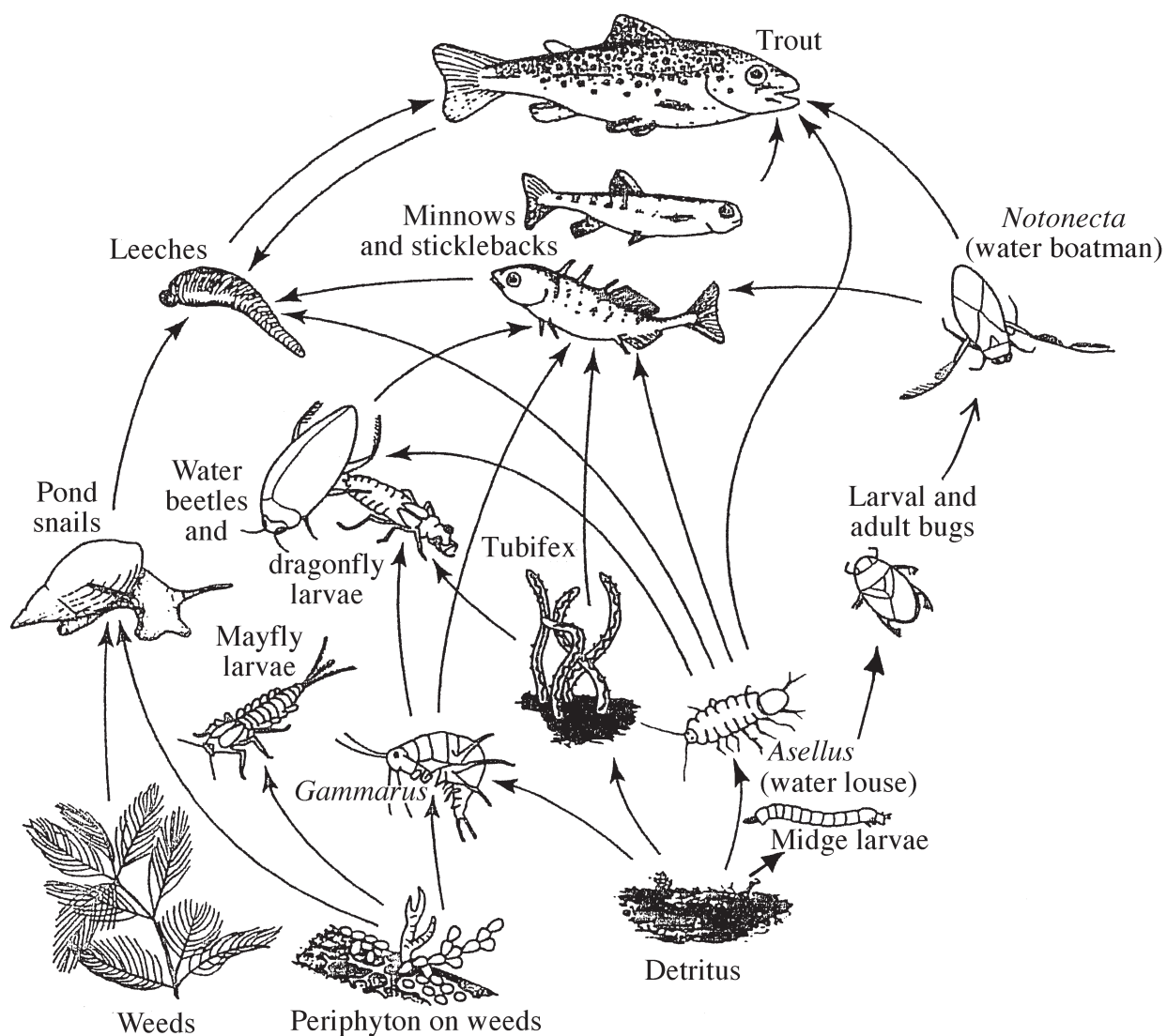
The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

1. The diagram below shows a food web found in fresh water.



(a) From the organisms shown in the diagram, give an example of:

(i) a producer;

[1]

.....

(ii) a herbivore;

[1]

.....

(iii) a tertiary consumer.

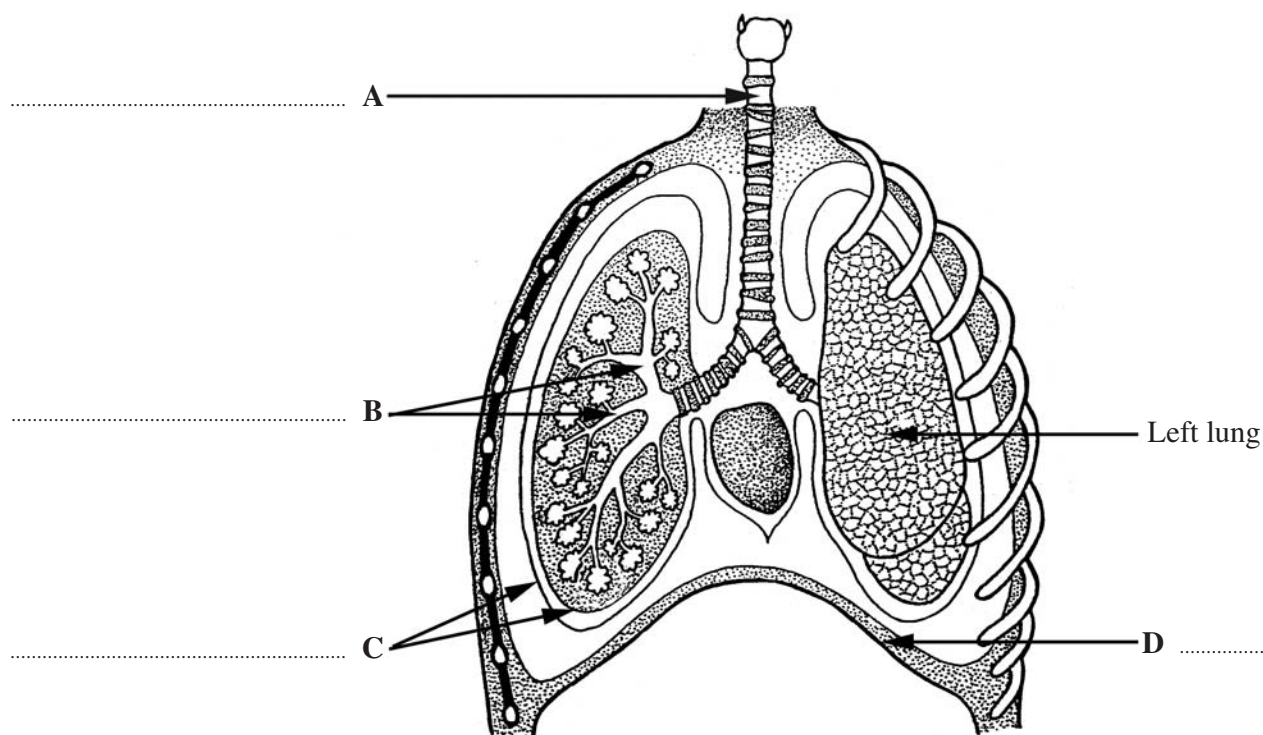
[1]

.....

- (b) In the diagram identify **one** food chain consisting of four organisms, starting with an autotroph. Construct a labelled pyramid of biomass representing **this** chain. [2]

(Total 5 marks)

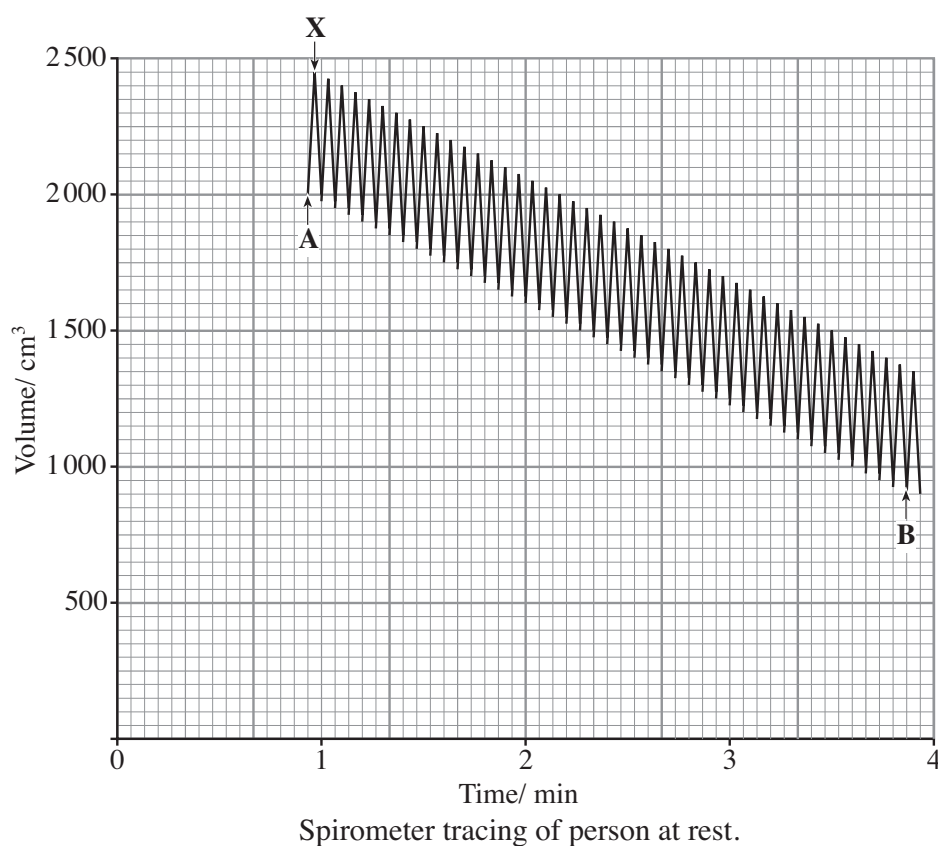
2. The diagram represents the mammalian respiratory system.



(a) Label structures **A-D** on the diagram.

[4]

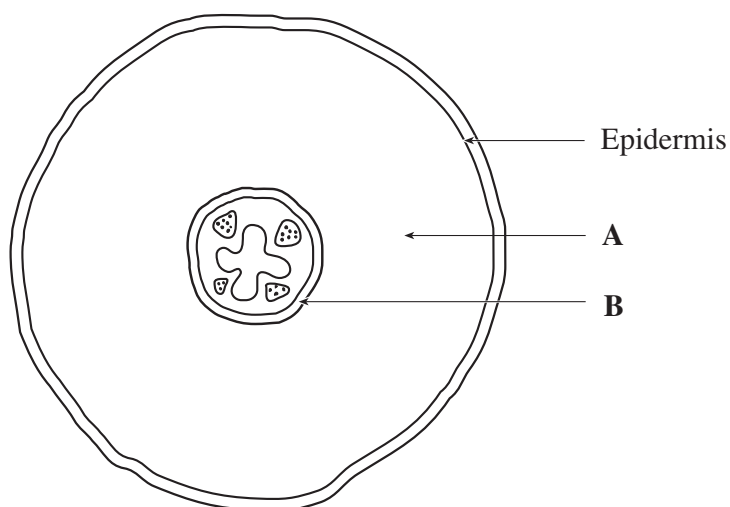
(b) A spirometer can be used to give data about various aspects of breathing and respiration. The following diagram shows readings taken from a spirometer which was initially filled with oxygen.



- (i) What is the breathing rate per minute for the person using the spirometer? [1]
.....
- (ii) What is the tidal volume of this person at point **X**? [1]
.....
- (iii) How much oxygen is used by this person from point **A** to point **B**? [1]
.....
- (c) Carbon dioxide in the exhaled gases is removed by passing the gases through soda lime or carbosorb before they are returned to the spirometer. Explain why the carbon dioxide levels in the blood would rise if the carbon dioxide in the exhaled gases was not removed. [2]
.....
.....
.....
.....
- (d) (i) What term is used to describe the air which remains in the lungs after forced exhalation? [1]
.....
- (ii) What is the role of surfactants in the respiratory system? [1]
.....

(Total 11 marks)

3. The diagram represents a transverse section of a root as seen using a light microscope.



- (a) (i) In some areas of the root, epidermal cells are specialised for the uptake of water and mineral ions. In the space below draw an outline diagram to show the shape of **one** cell from this region. [1]

- (ii) State **two** ways in which this cell is adapted for the uptake of water and mineral ions. [2]

.....

.....

- (b) State the parts of the cell in region A which are involved with the: [2]

Apoplast pathway,

Symplast pathway,

- (c) State how the cells in region **B** are structurally adapted to their function. [2]

.....

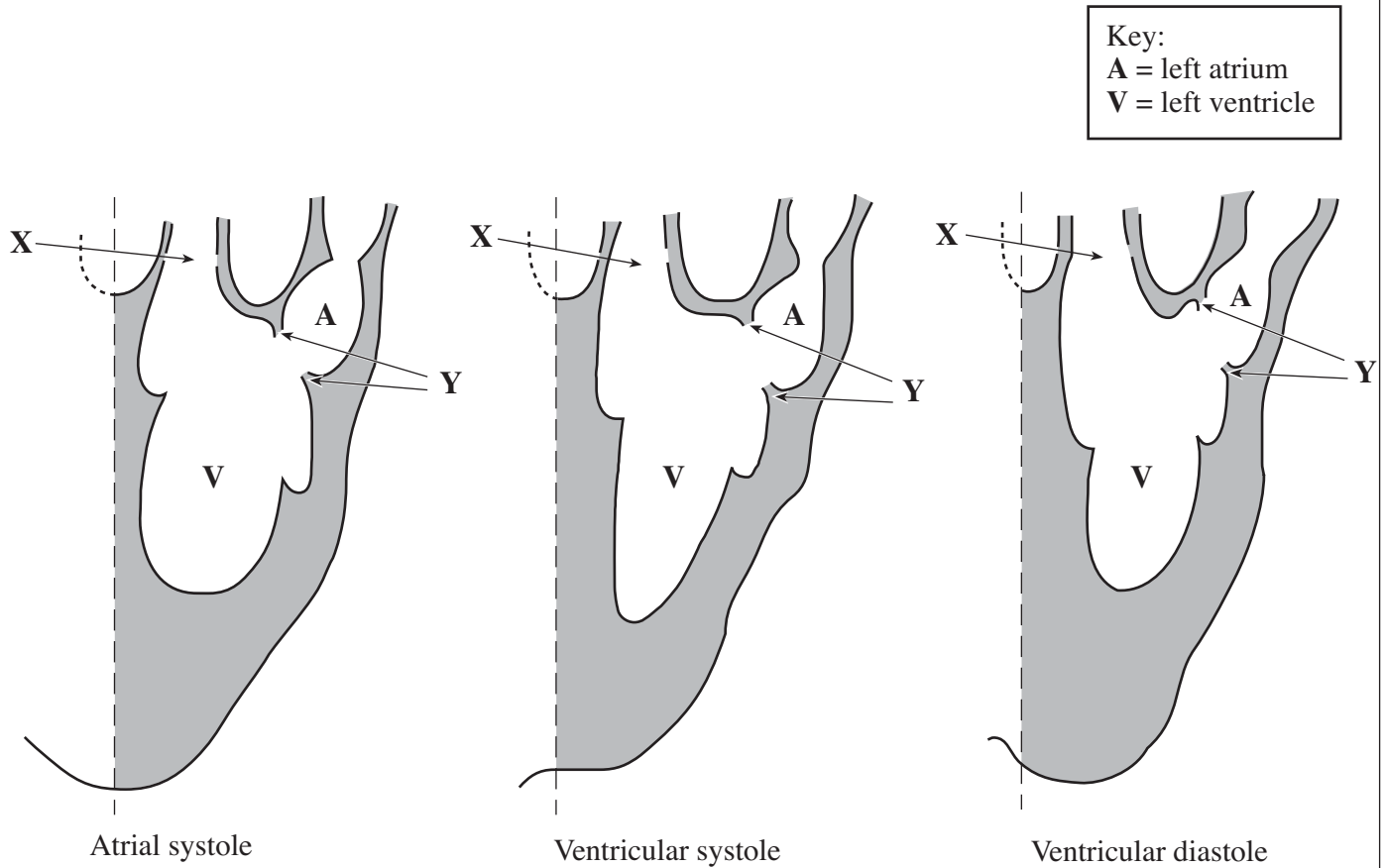
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- (d) Fungal spores which cause Dutch Elm disease are introduced into the xylem vessels in the trunk of the tree by beetles. Suggest why these spores do not travel to the roots. [1]

.....

(Total 8 marks)

4. (a) The diagrams show the left side of the heart in three stages of the cardiac cycle. **X** and **Y** represent the position of valves but the drawing of them is incomplete.



- (i) Give the names of the valves at **X** and **Y**.

[2]

X

Y

- (ii) Complete each diagram by drawing the valve at position **X** and the valve at position **Y** in each case showing clearly whether they are open or closed.

[3]

- (iii) Valves **Y** are attached to the heart wall by tendons. What is the function of these tendons?

[2]

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.....

.....

.....

- (b) During fetal development there is an opening in the septum between the right and left atria. This opening normally closes after birth but in some cases it does not, this condition is known as 'hole in the heart'. Suggest the effects this non-closure might have on the blood circulation system and the tissues of the body. [2]

.....

.....

.....

.....

(Total 9 marks)

5. (a) Which of the following biological terms is used to describe the following statements?

Community, density dependent predation, climax community, intra specific competition, pioneer species, population, stability, carrying capacity, biological control.

- (i) Members of the same species living in the same place at the same time. [1]

.....

- (ii) The numbers of a particular species which can be sustained in an environment for a long period of time. [1]

.....

- (iii) The stable end community resulting from succession. [1]

.....

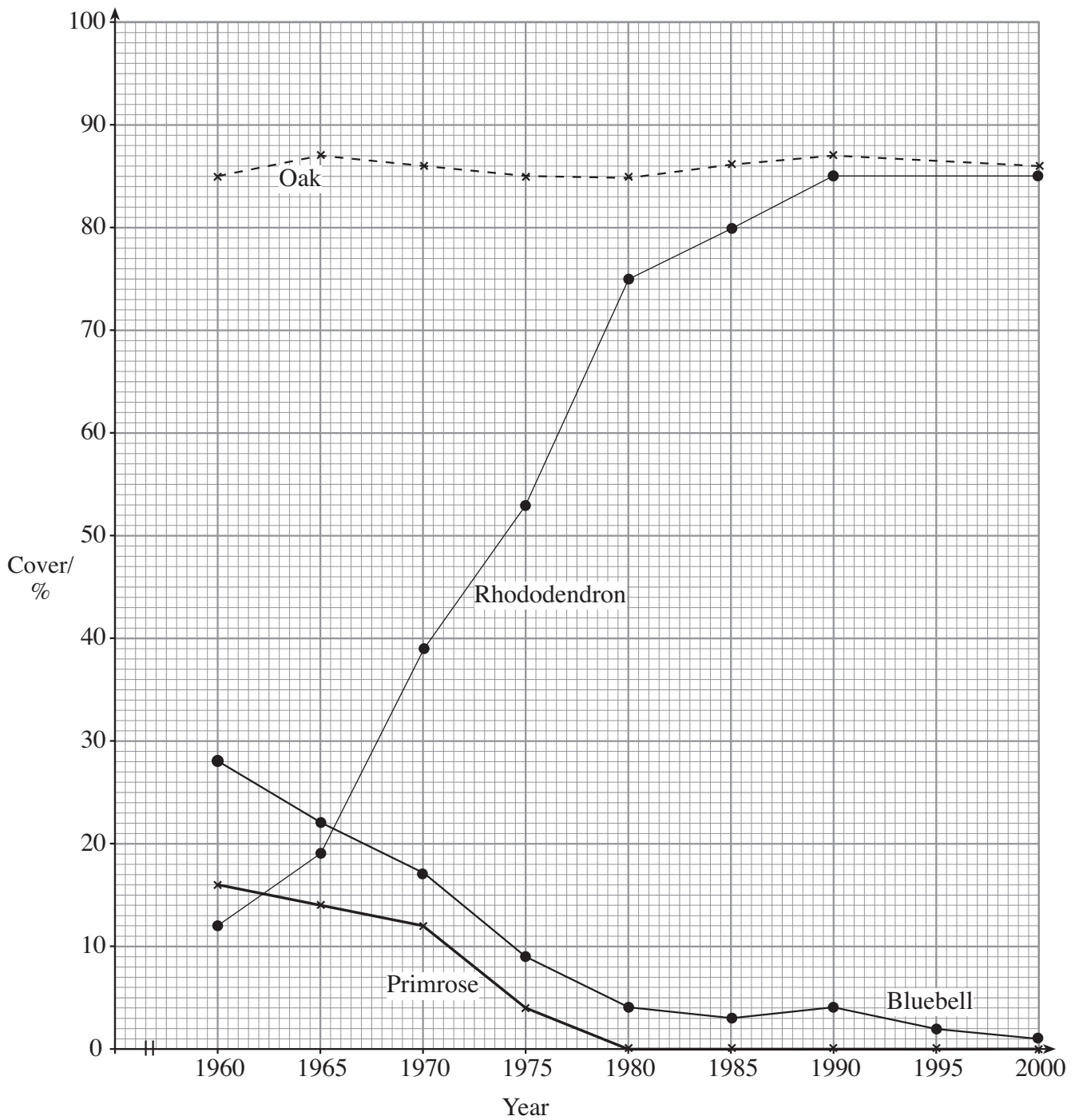
- (iv) The first species to colonise bare ground. [1]

.....

- (v) A higher percentage of prey is consumed at higher prey densities. [1]

.....

- (b) The graph shows the change in percentage (%) cover of four plants in an oak wood in North Wales between 1960 and 2000.



- (i) State the relationship between the data for rhododendron bushes and those for bluebell and primrose. [1]

.....

.....

- (ii) Suggest **one** reason for the change in percentage cover of bluebell and primrose. [1]

.....

.....

- (iii) Rhododendrons have been introduced into this country and are not a native species. Explain why the population of Rhododendrons increases. [1]

.....

.....

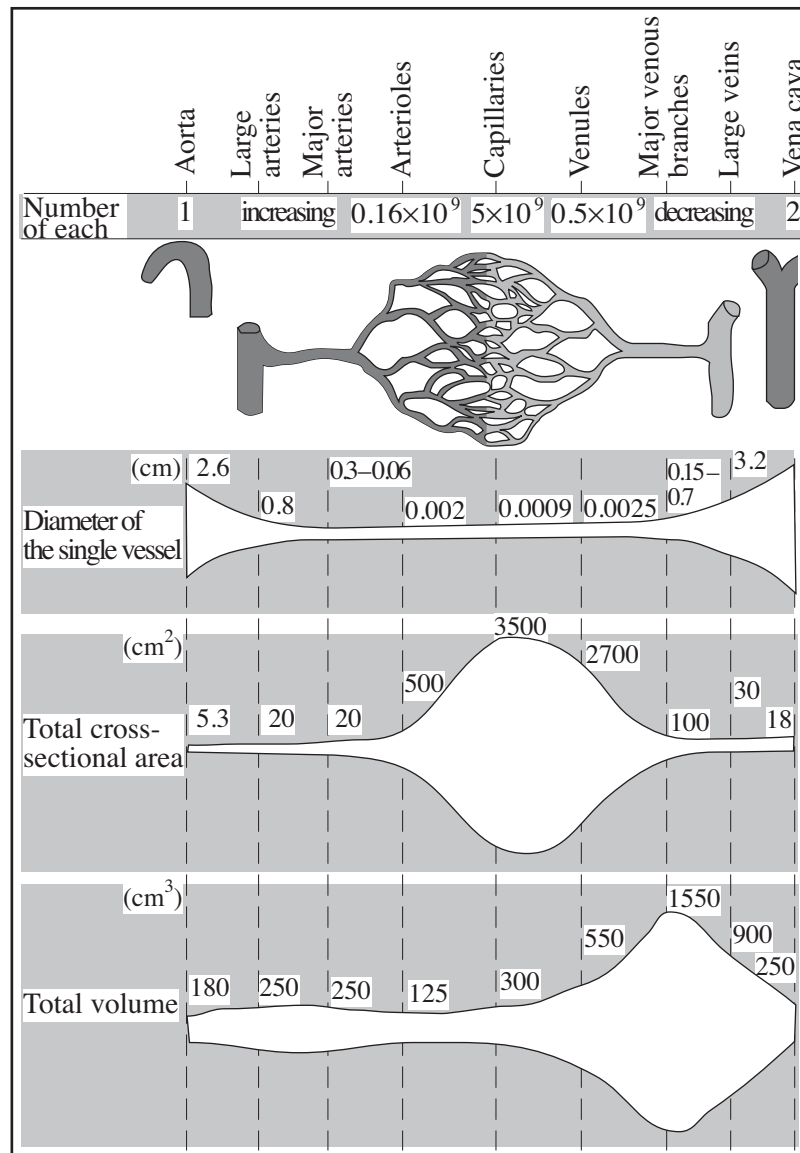
- (iv) Suggest how the woodland could be managed to conserve the native species. [1]

.....

.....

(Total 9 marks)

6. The diagram shows the diameter of individual blood vessels, the total diameter of each type of vessel and the total volume of blood in each type of vessel.



<http://www.newmanveterinary.com/circulat.html>

- (a) Using only information from the diagram, give **two** ways in which capillaries are adapted for the function of exchange. [2]

1

2

- (b) Suggest why there is no exchange between the blood in the arteries, arterioles, venules and veins with the tissues. [1]

.....

.....

- (c) In which type of blood vessels is the maximum amount of blood found? [1]

.....

- (d) There are well developed circular muscles in the walls of the arteries. Give **two** functions of these circular muscles. [2]

1

.....

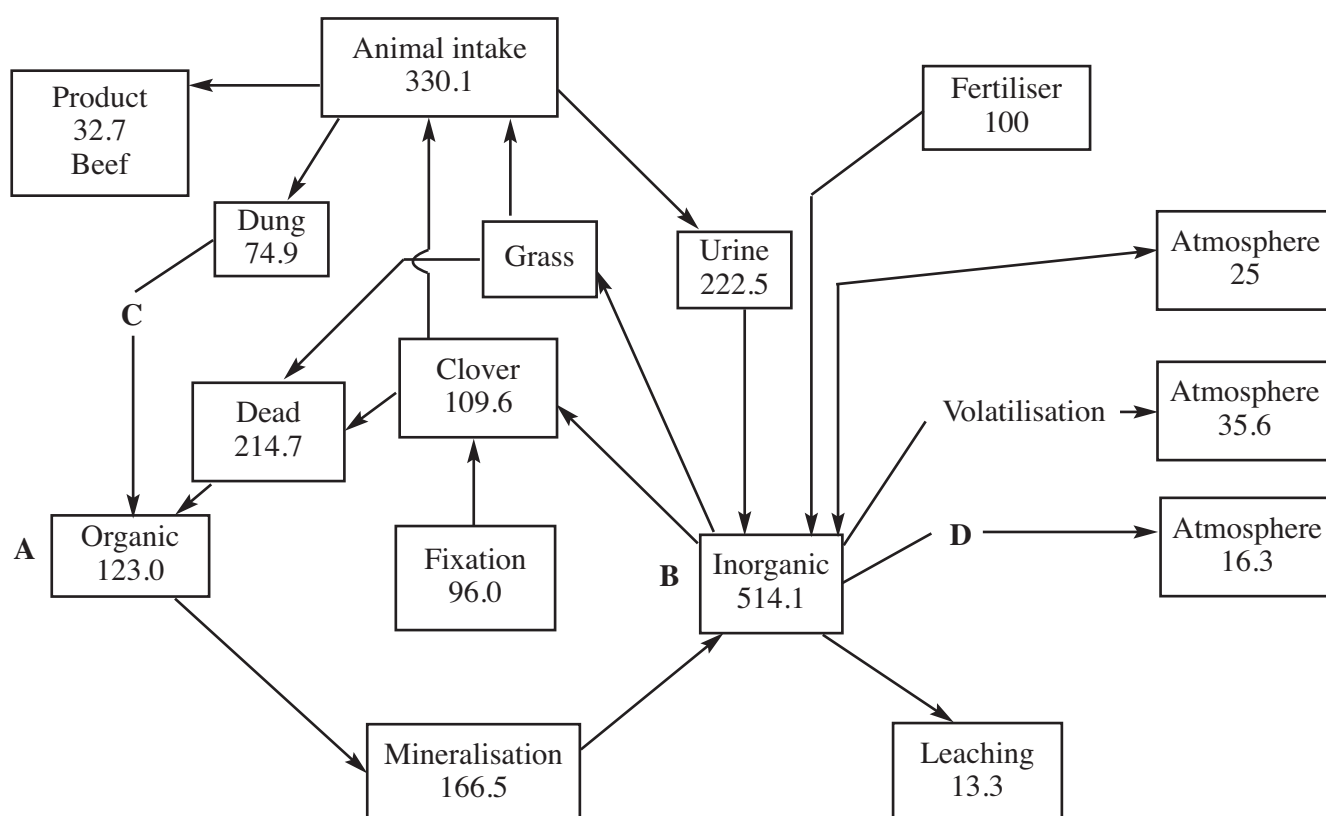
2

.....

(Total 6 marks)

7. Computer modelling is being used increasingly to represent individual aspects of the nitrogen cycle. One programme describes annual flow of nitrogen in grazed grassland according to fertiliser input, soil type, drainage, age of plants, previous management and climate. Data from such a simulation of nitrogen flow for permanent grassland is shown below. Study the diagram and answer the questions.

The term volatilisation is the natural loss of ammonia gas derived from faeces and urine to the atmosphere.



Annual flow of nitrogen through each compartment of the nitrogen cycle, kg/ha.

- (a) (i) Give **one** example of an organic nitrogen compound and **one** example of an inorganic form of nitrogen which could be referred to in boxes **A** and **B**. [2]

Organic

Inorganic

- (ii) Name the process referred to by arrow **C** and the process referred to by arrow **D**. [2]

C

D

- (iii) Clover has symbiotic bacteria of the genus *Rhizobium* living in root nodules. State how these bacteria increase the amount of available nitrogen to living organisms.

[2]

.....

.....

.....

.....

- (b) (i) Calculate the annual mass of nitrogen flowing into clover from inorganic nitrogen.

[1]

.....

.....

- (ii) Calculate the mass of annual flow of inorganic nitrogen into grass. Give your result in kg/ha and show your working.

[2]

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.....

.....

.....

- (c) The average application of nitrogen to winter wheat in the UK is 190 kg N/ha, but dairy grassland farmers need to add less (about 170kg N/ha). Suggest **three** reasons to account for the difference.

[3]

1

.....

2

.....

3

.....

(Total 12 marks)

Turn over.

Any diagrams included in your answer must be fully annotated.

Or (b) Discuss, using examples, the principles of chemical and biological control of pests and their relative advantages and disadvantages. [10]

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(312-01)